

# Notice of Allowability

Application No.

10/024,187

Examiner

Mark Ruthkosky

Applicant(s)

WARIISHI, KOJI

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 8/9/2004.
2. ☒ The allowed claim(s) is/are 1-7.
3. ☒ The drawings filed on \_\_\_\_\_ are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

*Mark Ruthkosky*  
9/2/04

**DETAILED ACTION**

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/9/2004 has been entered.

***Examiner's Amendment***

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee. The title of the invention has been amended to be clearly indicative of the invention to which the claims are directed.

The application has been amended as follows:

Change the title to, " Electrolyte Composition with a Molten Salt and Crosslinked Polymer"

***Claim Rejections - 35 USC § 102***

The rejection of claims 1-6 under 35 U.S.C. 102(e) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over McEwen et al. (US 2002/0110739) has been overcome by the applicant's amendment.

***Claim Rejections - 35 USC § 103***

The rejection of claims 1-6 under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 6,190,805), and further in view of Thrash et al. (US 4,643,958) has been overcome by the applicant's amendment.

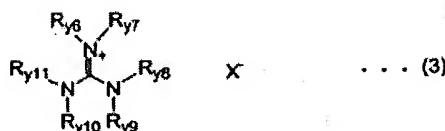
***Allowable Subject Matter***

Claims 1-7 are allowed.

The following is an examiner's statement of reasons for allowance:

The instant claims are to an electrolyte composition comprising a molten salt represented by the claimed formulae

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including pyridinium and imidazolium cations, a crosslinked polymer, crosslinked by an atomic group having a substructure of  $-\text{C}-\text{C}-\text{heteroatom}-$  at two or more positions adjacent to an electron-withdrawing group, said hetero atom being at least one atom selected from the group consisting of S, N, and O, prepared by a reaction between an electrophile having at least two unsaturated bonds polarized by an electron withdrawing group and a nucleophile having a plurality of nucleophilic groups, and a metal salt containing a Group IA or Group IIA metal ion.

The prior art does not teach an electrolyte comprising a molten salt represented by the claimed formulae and a crosslinked polymer, wherein the crosslinking by an atomic group having a substructure of  $-\text{C}-\text{C}-\text{heteroatom}-$  at two or more positions adjacent to an electron-withdrawing group, said hetero atom being at least one atom selected from the group consisting of S, N, and O.

The most pertinent prior art has been presented. McEwen et al. (US 2002/0110739) teaches an electrolyte composition comprising a molten salt represented by the claimed formulae

including pyridinium and imidazolium cations, a polymer and a metal salt containing a Group IA or Group IIA metal ion. Lithium salts combined with an organic cation salt including pyridinium and imidazolium cation salts and a polymer may be included in the mixture. Non-aqueous secondary batteries are further noted, (claims 10-37, the examples and table 2.) The reference does not teach the electrolyte comprising a molten salt to include a crosslinked polymer, wherein the crosslinking by an atomic group having a substructure of  $-C-C-$  heteroatom- at two or more positions adjacent to an electron-withdrawing group, said hetero atom being at least one atom selected from the group consisting of S, N, and O.

Takeuchi et al (US 6,190,805) teaches a polymer electrolyte composition including nitrogen or phosphorous cation containing salt such as pyridinium and imidazolium cations, metal salts containing a Group IA or Group IIA metal ion and polymer materials (see col. 25, line 55 to see col. 26, line 7, and examples 1-50.) Ammonium salts are noted to have high solubility and dissociation constants in the polymer electrolyte. Takeuchi et al (US 6,190,805) does not teach the electrolyte comprising a molten salt to include a crosslinked polymer, wherein the crosslinking by an atomic group having a substructure of  $-C-C-$  heteroatom- at two or more positions adjacent to an electron-withdrawing group, said hetero atom being at least one atom selected from the group consisting of S, N, and O.

Instant claim 7 is to a process for manufacturing an electrolyte composition comprising a molten salt represented by the claimed formulae, a polymer prepared by a reaction between an electrophile having at least two unsaturated bonds polarized by an electron withdrawing group and a nucleophile having a plurality of nucleophilic groups, and a metal salt containing a Group IA or Group IIA metal ion, wherein the process comprises adding an electrophile and a

nucleophile to the molten salt of the electrolyte and reacting the electrophile and the nucleophile by a Michael-type addition reaction to thereby form a cross-linked polymer. The electrophile has at least two polarized, unsaturated bonds polarized by an electron-withdrawing group. The nucleophile has a plurality of nucleophilic groups, wherein the nucleophilic groups are selected from the group consisting of  $\text{-NH}_2$ ,  $\text{-SH}$ ,  $\text{-S-}$ ,  $\text{SO}_2\text{H}$ ,  $\text{SO}_2^-$ ,  $\text{-OH}$ , and  $\text{-COOH}$ .

The most pertinent prior art has been presented. The references do not teach a process for manufacturing an electrolyte composition comprising a molten salt represented by the claimed formulae including pyridinium and imidazolium cations, a polymer prepared by a reaction between an electrophile having at least two unsaturated bonds polarized by an electron withdrawing group and a nucleophile having a plurality of nucleophilic groups, and a metal salt containing a Group IA or Group IIA metal ion, wherein the process comprises adding an electrophile and a nucleophile to the molten salt of the electrolyte and reacting the electrophile and the nucleophile by a Michael-type addition reaction to thereby form a cross-linked polymer. The electrophile has at least two polarized, unsaturated bonds polarized by an electron-withdrawing group. The nucleophile has a plurality of nucleophilic groups, wherein the nucleophilic groups are selected from the group consisting of  $\text{-NH}_2$ ,  $\text{-SH}$ ,  $\text{-S-}$ ,  $\text{SO}_2\text{H}$ ,  $\text{SO}_2^-$ ,  $\text{-OH}$ , and  $\text{-COOH}$ . The reference does not teach a method, as claimed, including the addition of an electrophile and a nucleophile to the molten salt of the electrolyte and reacting the electrophile and the nucleophile by a Michael-type addition reaction to thereby form a cross-linked polymer. Thus, the claims are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Examiner Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mark Ruthkosky  
Primary Patent Examiner  
Art Unit 1745

  
9/2/04